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**NON-FMPC SOURCES OF RADIOACTIVITY IN ENVIRONMENTAL  
SAMPLES - (USED AS A REFERENCE IN OU2 AND OU5 RI  
REPORTS)**

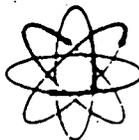
07/26/83

**NLO, INC      DOE  
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LETTER**

6373

**NLO, Inc.**

A SUBSIDIARY OF NL INDUSTRIES, INC.



P. O. BOX 39158

CINCINNATI, OHIO 45239

PHONE: AREA CODE: 513-738-1151

JUL 26 1983

Mr. M. R. Thaisen, Director  
 Weapons Division  
 Department of Energy  
 Oak Ridge Operations  
 P. O. Box E  
 Oak Ridge, Tennessee 37830

Dear Mr. Thaisen:

**INFORMATION ON GROUNDWATER MONITORING**

Attached are five sections covering the following groundwater topics:

1. Available Well Water Samples.
2. Non-FMPC Sources of Radioactivity in Environmental Samples.
3. Offsite Wells Near the FMPC.
4. Isotopic Information.
5. Organic Compounds in Groundwater.

Sincerely yours,  
 Original Signed By  
 R. M. SPENCELEY  
 Manager  
 R. M. Spenceley  
 Manager

DAF:TAD:NRB/vva  
 Atts.

cc: M. W. Boback  
 W. H. Travis  
 ✓ R. B. Weidner  
 M. R. Thaisen

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1. Available Well Water Samples:

Tables 1.1 and 1.2 list the water samples which are presently stored in the Bioassay Laboratory..

Table 1.1. Sample From Offsite Wells

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<u>Sample Identification</u>	<u>Date Collected</u>
Branch Hill Mobile Home Park	6/29/83
B. Knollman Residence	6/28/83
Best Panel Homes	6/28/83
Denier Electric	6/28/83
Delta Steel	6/28/83
H. Knollman Residence	6/28/83
J. Stevens Residence	6/28/83
K. Yoakum Residence	6/29/83
Mobil Chemical	6/28/83
Miami Valley Ready Mix	6/28/83
Ray Evers Welding	6/28/83
W. Knollman Residence	6/28/83

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Table 1.2. Samples From Onsite Wells

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<u>Sample Identification</u>	<u>Date Collected</u>	
Production Well 1	1/21/83	4/29/83
Production Well 2	1/21/83	4/29/83
Production Well 3	1/21/83	4/29/83
Test Well 1 Shallow	---	4/29/83
Test Well 1 Deep	1/21/83	4/29/83
Test Well 3	1/21/83	4/29/83
Test Well 4	1/21/83	4/29/83
Test Well 5	1/21/83	4/29/83
Test Well 8 Shallow	1/21/83	4/29/83
Test Well 8 Deep	1/21/83	4/29/83
Test Well 9	---	4/29/83
Test Well 10	1/21/83	4/29/83
Test Well 11	1/21/83	4/29/83
Old Administration Building	---	4/29/83
Cone House	1/21/83	4/29/83

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## 2. Non-FMPC Sources of Radioactivity In Environmental Samples

On two occasions, elevated radioactivity in environmental samples has been caused by offsite operations not associated with the FMPC. In 1963, analyses for potassium showed that elevated beta activity in Paddy's Run samples was due to the radioisotope potassium-40. Naturally-occurring potassium consists of 93.1% K-39, 6.88% K-41 and about 0.012% K-40. Potassium-40 is a beta emitter and produces about 1900 disintegrations per minute per gram of total potassium. The potassium was in the effluent from a Fernald chemical plant which discharged into Paddy's Run a short distance upstream from New Haven Road. A sample of the chemical plant discharge was collected October 23, 1963. The potassium concentration was 1270  $\mu\text{g/mL}$  and the K-40 content produced all of the observed beta activity of 2.34 d/m/mL. Solids discharged from this chemical plant were occasionally observed in Paddy's Run; on November 11, 1964, a layer of light gray gelatinous material covered the stream bottom from the plant discharge point to State Route 128, a distance of about 4500 feet.

More recently, potassium-40 has been the cause of elevated beta radioactivity in samples from two offsite wells in the Fernald area. Samples collected November 24, 1981 were analyzed and two wells were found to have elevated beta radioactivity due to K-40:

<u>Offsite Well</u>	<u><math>\mu\text{g K/mL}</math></u>	<u>Beta Radioactivity, d/m/mL</u>	
		<u>Observed</u>	<u>Calculated from K concentration</u>
JS	312	0.70	0.58
RE	110	0.24	0.20

Wells JS and RE are located in Fernald, down gradient from the Fernald chemical plants. Elevated concentrations of potassium have not been observed in wells near the FMPC boundary.

3. Offsite Wells Near the FMPC

Most attention has been directed at defining the extent of, and locating the source of, elevated uranium levels south of the FMPC site. Some information has been obtained for areas east and west of the FMPC, mostly from the recent USGS sampling work. The locations of the wells sampled by the USGS are shown in Figure 3.1. The concentrations of uranium in the wells located east and west of the FMPC were all determined to be less than 2  $\mu\text{g U/L}$ , which is within the range of background and are far below those values determined south of the FMPC. Our plans include the collection of well water samples from additional locations north and east of the FMPC site within the next few weeks.



#### 4. Isotopic Information

Uranium isotopic analyses have been performed on well water samples collected onsite and offsite near the FMPC. Sampling locations include all fifteen onsite production and test wells, and four offsite wells. All analyses were performed by ORNL and the results are given in Table 4.1. Results for the sixteen samples collected in late May, 1983 have just been received and interpretation of the data has not been made.

Table 4.1 Results of Uranium Isotopic Analyses Performed on FMPC Onsite and Offsite Wells

Sample			Isotopic % by Weight			
Location ID	Location Description	Collection Date	U-234	U-235	U-236	U-238
DS	Offsite Well	8/25/82	0.0052	0.709	0.0007	99.285
HK	Offsite Well	8/25/82	0.0052	0.699	0.0008	99.295
MC-S	Offsite Well	8/31/82	0.0055	0.728	0.0031	99.264
SW-2	Southwestern Ohio Water Co. Collector #2	5/19/83	0.0063	0.732	0.0090	99.253
P-1	NLO Prod. Well	5/27/83	0.0063	0.713	0.0217	99.259
P-2	NLO Prod. Well	5/27/83	0.0060	0.744	0.0241	99.225
P-3	NLO Prod. Well	5/27/83	0.0072	0.881	0.0339	99.078
T-1S	NLO Test Well	5/27/83	0.0056	0.654	0.0022	99.338
T-1D	NLO Test Well	5/27/83	0.0051	0.700	0.0218	99.273
T-3	NLO Test Well	5/27/83	0.0064	0.706	0.0044	99.283
T-4	NLO Test Well	5/27/83	0.0035	0.470	0.0055	99.521
T-5	NLO Test Well	5/27/83	0.0057	0.666	0.0069	99.321
T-8S	NLO Test Well	5/27/83	0.0064	0.915	0.0372	99.041
T-8D	NLO Test Well	5/27/83	0.0052	0.609	0.0166	99.369
T-9	NLO Test Well	5/27/83	0.0061	0.697	0.0048	99.292
T-10	NLO Test Well	5/27/83	0.0074	0.697	0.0011	99.294
T-11	NLO Test Well	5/27/83	0.0055	0.740	0.0184	99.236
OAB	NLO Test Well	5/27/83	0.0046	0.639	0.0188	99.338
CH	NLO Test Well	5/27/83	0.0049	0.704	0.0043	99.287

## 5. Organic Compounds In Groundwater

Water Samples collected from one offsite and seven onsite wells on May 11, 1983, were sent to PEDCo Environmental, Inc., Cincinnati, Ohio for analyses for various organic materials. Special bottles containing preservative for collecting the samples and a styrofoam cooler, which was used for refrigerating the samples immediately after collection, were supplied by PEDCo.

Results of the analyses are listed in Table 5.1. The first five compounds: 1,1,1-trichloroethane, trichloroethylene, perchloroethylene, tributyl-phosphate, and kerosene are the organic chemicals which have been routinely used in large quantities at the FMPC throughout the years and could be possible sources of contamination. The results show that none of these compounds were detected in the well water samples. In addition, the total organic halogen results show that no halogenated organic compounds were present in the samples above the detection limit for this analysis.

Some form of organic carbon was present in all the well water samples analyzed as indicated by the total organic carbon (TOC) results. It is likely that the organic carbon in these samples was due to the presence of naturally-occurring organic materials in the groundwater. Water soluble organic materials above ground, such as tannins, in tree bark, are dissolved by rain and river water and transported to groundwater. As yet, we have not found any published data on background levels of TOC in groundwater in this area. Test Well 11 is upgradient from the plant site and would be indicative of the naturally-occurring levels of TOC in the groundwater in the vicinity of the FMPC. The magnitude of the TOC results for the other well samples is the same as that for Test Well 11. Consequently, the TOC found in all the well samples may be from natural sources. In the future, samples from distant upgradient wells will be obtained to determine background levels of TOC in the groundwater.

We are pursuing with PEDCo the possibility of identifying the total organic carbon compounds in the well samples. ~~This may be a difficult task depending~~ on the number and type of compounds naturally occurring in the groundwater. As a first step, PEDCo is examining the raw data obtained during the analyses listed in Table 5.1 to determine if information was obtained to indicate the presence or absence of other organic compounds in the samples. They have also been requested to propose any additional analyses which could be employed for the identification of the total organic compounds.

Table 5.1. Organic Compounds In Well Water Samples

All Samples Collected 5/11/83

<u>Parameter</u>	<u>Units and Detection Limits</u>	<u>Well Identification</u>							
		<u>1S Onsite</u>	<u>1D Onsite</u>	<u>4 Onsite</u>	<u>8S Onsite</u>	<u>8D Onsite</u>	<u>10 Onsite</u>	<u>11 Onsite</u>	<u>DS Offsite</u>
1,1,1-Trichloro- ethane	2 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Trichloro- ethylene	2 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Perchloro- ethylene	2 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Tributyl- phosphate	50 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Kerosene	100 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Total Organic Halogen	10 µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Total Organic Carbon	1 mg/L	30.2	69.0	38.6	42.1	43.5	67.9	46.9	45.2

ND = Not Detected.

**OFFICIAL USE ONLY****OFF-SITE GROUNDWATER MONITORING LOCATIONS (1)**

<u>Location</u>	<u>WMCO Field I. D. No.</u>	<u>WMCO EMR (2) I. D. No.</u>	<u>USGS I. D. No.</u>	<u>IT (4) I. D. No.</u>	<u>D&amp;M I. D. No.</u>
Branch Hill Mobile Home Park 11200 Rt. 128	BHMHP	16	H-109	EMR-16	OS-13
Bryon L. Knollman [REDACTED]	BLK	14	H-106	EMR-14	OS-14
Best Panel Homes 11301 Paddy's Run Road	BPH	10	H-101	EMR-10	OS-11
Denier Electric 10891 Rt. 128	DE	18	H-110	EMR-18	OS-15
Donald Gieringer [REDACTED]	DG	22	H-103	NA	NA
Delta Steel Corp. Paddy's Run Rd.	DS	15	H-111	EMR-15	OS-2
Henry Knollman (shallow & deep) [REDACTED]	HKs HKd	12 26	H-108 NA	EMR-12S EMR-12D	OS-1 15d
Jasper Stevens [REDACTED]	JS	20	H-117		OS-19
Verdie Estes [REDACTED]	VE	11	H-116	EMR-11	OS-12
Albright & Wilson, Inc. Paddy's Run Road	AW	17	H-121	EMR-17	OS-3
Maimi Valley Ready Mix 7466 New Haven Road	MVRM	21	H-119	EMR-21	OS-16
Ray Evers Welding 7542 New Haven Road	RE	19	H-118	EMR-19	OS-18
William Knollman [REDACTED]	WK	13	H-107	EMR-13	OS-17

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<u>Location</u>	<u>WMCO Field I. D. No.</u>	<u>WMCO EMR (2) I. D. No.</u>	<u>USGS I. D. No.</u>	<u>IT (4) I. D. No.</u>	<u>D&amp;M I. D. No.</u>
Russell Beckner [REDACTED]	RB	3	NA	EMR-3	OS-8
Dorothy Henshaw [REDACTED]	DH	1	NA	EMR-1	OS-10
Dorothy Nieman [REDACTED]	N	4	NA	NA	OS-4
Clayton Walther [REDACTED]	CW	5	NA	EMR-5	OS-5
Ada May Lindsey [REDACTED]	AL	6	NA	EMR-6	OS-6
Shaw Farm 3357 St. 126	S	7	NA	NA	OS-7
Southwestern Ohio Water Co. Collector #1 E. Miami River Rd.	SW1	9	NA	EMR-9	NA
Southwestern Ohio Water Co. Collector #2, Rt. 128	SW2	8	NA	EMR-8	NA
Doris Turner [REDACTED]	DT	23	NA	NA	NA
Renck's Nursery (house & barn) 11765 Rt. 128	RNh RNb	25 24	NA NA	NA NA	NA NA
Fort Scott (3) River Road	FS	27	NA	NA	NA

Footnotes: (1) As of August 1, 1986  
 (2) EMR = Environmental Monitoring Report  
 (3) Added to Program in July, 1986  
 (4) The letters "FLSGW" precede each IT I.D. No.

General: Sampling of well No. 2 was discontinued as per homeowner's request.

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